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Art. 7. Palmæ regales.—Roystoneæ

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Occasional Papers on the Kinds of Plants

By L. H. Bailey

7. The Royal Palms—Preliminary Survey

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FIG. 191. MATCHLESS AVENUE TREE, *Roystonea oleracea*, as seen in the Botanic Garden at Rio de Janeiro, Brazil.

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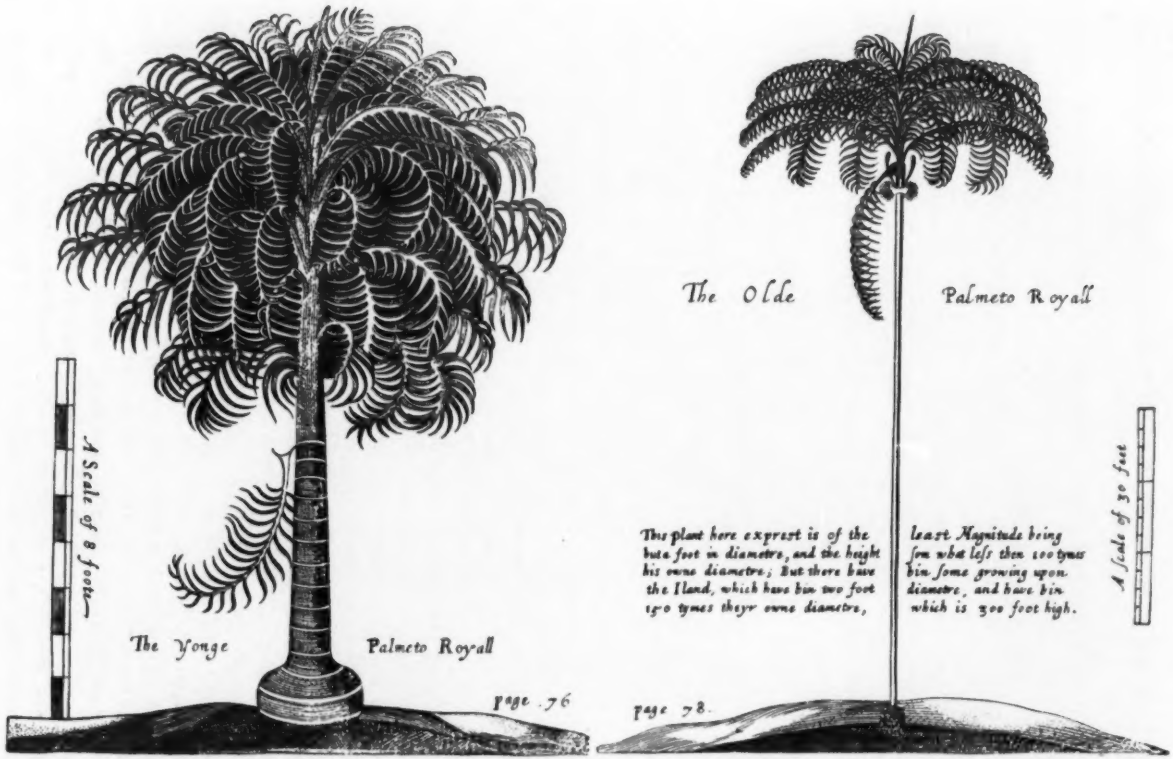
ARTICLE 7. THE ROYAL PALMS—PRELIMINARY SURVEY

It must have been a startling prospect to water-weary voyagers from Europe approaching the new islands of the westward seas to behold the towering palms on emerging landfalls. Above the common vegetation the trees may have stood, like monarchs of wild domains; no wonder men called them Royals. No wonder either that the abundant little seeds were spread about the world when ships sailed away and that trees now stand as commanding sentinels or in grand avenues far from the western Indies.

Thus it is that in A True and Exact History of the Iland of Barbadoes, by Richard Ligon, Gent., in 1657, the "Palmeto Royall" is described in glowing terms:

"Another kind of Palmeto there is, which as it has an addition to the name, has likewise an addition to the nature: for I beleive there is not a more Royall or Magnificent tree growing on the earth, for beauty and largeness, not to be paralell'd; and excels, so abundantly in those two properties and perfections, all the rest, as if you had ever seen her, you could not chuse but fall in love with her; I'm sure I was extreamly much, and upon good and Antique Authority: For if Xerxes strange Lydian love the Plantane tree, was lov'd for her age, why may not I love this for her largeness? I beleive there are more women lov'd for their largeness then their age, if they have beauty for an addition, as this has; and therefore I am resolv'd in that poynt, to go along with the multitude, who run very much that way: but how to set her out in her true shape and colour, without a Pencil, would aske a better Pen than mine."

This writer leaves us two pictures, of a young tree and an old one, and these are reproduced herewith as Figs. 192 and 193. He estimates that these trees may reach the height of 312 feet. He speaks of the young tree bellied at the base, and later proceeds: "About the time this tree parts with her belly, & grows to a slender kind of shape, she drawes up amongst her roots some of the soyle that bred her, about two foot higher than the levell of ground that is neer it; and by reason it is held in by an infinity of small roots, that come from the body, it there remaines firm, and falls not down; the outside of this earth is about a foot round about, broader than the diameter of the tree; so that if the diameter of the tree be a foot, the diameter of this earth is three foot at top, but somewhat more below; for the sides are not so steep, as to hold one breadth above and below. If this earth were beautifull, smooth, and large enough, it might be called the Pedistan to that Corinthian Pillar, the Palmeto Royall. But what is wanting in the Pedistall, is supplyed in the dimensions of the Pillar; for, the Corinthian Pillar is allowed for length but nine of her own diameters, and this will not aske leave to take 150, which makes her the more beautifull,


A Scale of 8 foote
The Yonge Palmeto Royall
Page 76
The Olde Palmeto Royall
A Scale of 50 foot
This plant here expreſt is of the
best foot in diametre, and the height
his owne diametre; but there have
the Iland, which have bin two foot
150 tymes theyr owne diametre,
least Magnitude being
from what leſs then 100 tymes
bin some growing upon
diametre, and have bin
which is 300 foot high.
Page 78.

FIGS. 192, 193. THE PALMETO ROYALL of Richard Ligon, Barbados, 1657, trees young and old. While the pictures are not photographically precise, they are nevertheless unmistakable. We now know this tree as *Roystonea oleracea*. Caribbee royal palm.

since the strength she hath, is able to support the weight she bears: And for the Architrave, Frize, and Cornise, they are not to be compar'd with the beauty of the head of this Pillar, together with the fruit & supporters. And I believe, if *Vitrusius* himself had ever bin where this Pillar grew, he would have chang'd all his deckings and garnishings of Pillars, according to the form of this. And though the Corinthian Pillar be a Columne laciviously deckt, like a Curtesan, and therein participating (as all inventions do) of the place where they were first born; (*Corinth* having been without controversy, one of the wantonnest townes in the world) yet, this wants nothing of her beauty, and yet is chast, which makes her the more admirable, and the more worthy to be prised."

Ligon describes the fruits and states that "the Hoggs find them very agreeable to their palats for those that eat of them grow suddenly fat," thus recording a use now well known where the royal palms grow. He details the use of the logs in building houses, but says nothing about the edible great terminal bud or "cabbage" so persistently associ-

FIG. 194. BEGINNING OF THE BOTANICAL IDENTITY of the Caribbee royal.—*Areca oleracea* of Jacquin, 1763.

ated with the history of this palm. Perhaps this utilization had not then developed; first actual settlement in Barbados was made in 1625.

Perhaps we are no longer interested in these majestic palms in the spirit of Ligon and his cotemporaries, and the pictures of that day, no doubt well expressing the wonderment of the time, are to us only quaint. Yet the palms remain, and are ever-present factors in the lives of the people where they grow. With the clearing of forests and the making of institutions, these palms have become avenue trees, so well attested in Fig. 191; or they are single sentinels over houses as in the picture 195, and stand in parks and yards and fields. Sentiment attaches to them; thus at the end of one of the great avenues at the Jardim Botanico at Gavea in Rio de Janeiro, is a temple with a marble figure therein and legend on the lintel, "Dea palmaris," the palmary goddess.

When we come to Griffith Hughes in his illustrated account "Of Vegetables" in Natural History of the Island of Barbados, 1750, we have full description of "The Cabbage-tree; *Lat.* Palma Maxima," even yet still quaint to us, beginning: "This Tree is by some Authors called *The Palmeto Royal.* And well may it be called Royal from its great Height, majestic Appearance, and Beauty of its waving Foliage: Neither the tall Cedars of *Lebanon*, nor any of the Trees of the Forest, are equal to it in Height, Beauty, or Proportion; so that it claims among Vegetables that Superiority which *Virgil* gives to *Rome*, among the Cities of *Italy*."

Hughes has an excellent full-page plate of this palm, dedicated "To His Royal Highness Frederick, Prince of Wales," and descriptions so pertinent that they may be reprinted.

Of the general aspect he writes: "The Trunk jets or bulges out a little near the Ground, by which means it hath the becoming Appearance of a substantial Basis to support its towering Height. It is generally as strait as an Arrow; and scarce can a Pillar of the nicest Order in Architecture be more regular, especially when it is of about Thirty Years Growth: And as there is a natural involuntary Pleasure arising from the Harmony of just geometrical Proportions, striking the Eye of the most unskilful and ignorant Beholder, it is not strange that these Trees are universally admired.

"Writers of Wonders represent some of them to be Three hundred Feet in Height: However, the highest in this, where they are more numerous than in any of our neighbouring Islands, is but an Hundred and Thirty-four Feet."

He writes of the "green Part" of the shaft above the ash-colored bole, which is "about Five Feet in Length," saying that it is formed of several exfoliations. This upper part of the royal palm column is a striking feature of these trees; it appears not to have received a technical name until the present writer proposed *crownshaft* in his paper of March 1933 (Gent.

Herb. iii, 12); his first conviction of such a term arose from studies of trees on the islands Trinidad and Barbados.

"When these very tough husky Exfoliations are taken off," continues Hughes, "what is called the Cabbage, lies in many thin, snow-white, brittle Flakes; in Taste something like the Kernel of an Almond, but sweeter: It is so full of Oil, that a curious Observer may see several very small Cells abounding with it. These Flakes are called, from some Resemblance, when boiled, the Cabbage, which then eats somewhat sweet and agreeable: Yet I have always thought it the Height of Extravagancy and Luxury to fell so stately a Tree, which would be an Ornament to the most magnificent Palace in *Europe*, to gratify the Taste of any Epicure, especially as there is but a very small Part of it eatable."

Hughes describes another edible part, the "Cabbage-flower," the young strands of the inflorescence then used for pickles: "What is called the

FIG. 195. CHARACTERISTIC TREE of Caribbee royal, *Roystonea oleracea*, in Port-of-Spain, Trinidad. Note the "clear story" or crownshaft above the flower-clusters. At left, three trees of betel-nut palm, *Areca Cathecu* of Linnæus (*A. Catechu* of Willdenow).

Cabbage-flower, grows from that Part of the Tree where the Ash-coloured Trunk joins the green Part already described.

"Its first Appearance is a green husky *Spatha*, growing to above Twenty Inches long, and about Four broad; the Inside being full of small white stringy Filaments, full of alternate protuberant Knobs, the smallest of these resembling a Fringe of coarse white Thread knotted: These are very numerous, and take their Rise from larger Footstalks; and these Footstalks likewise are all united to different Parts of the large Parent-stalk of all.

"As this husky *Spatha* is opened, while thus young, the farinaceous yellow Seed, in Embryo, resembling fine Saw-dust, is very plentifully dispersed among these stringy Filaments, which answer the Use of *Apices* in other more regular Flowers: These Filaments, being cleared of this Dust, are pickled, and esteemed among the best Pickles, either here or in *Europe*.

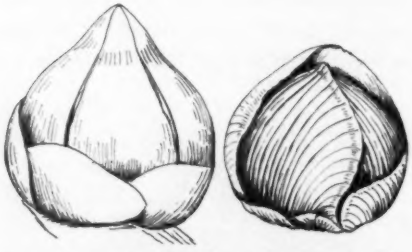


FIG. 196. PISTILLATE BUDS, much enlarged, of Roystonea at left showing valvate petals and of *Euterpe globosa* at right with imbricate petals. At full anthesis the calyx and corolla do not expand, but three stigmas appear at the apex.

"But if this *Spatha* is not cut down and opened, whilst thus young; if it be suffered to continue on the Tree till it grows ripe and bursts; then the inclosed Part, which, whilst young and tender, is fit for pickling, will, by that time, have acquired an additional Hardness, become soon after ligneous, grow bushy, consisting of very small Leaves, and in time produce a great Number of small oval thin-shelled Nuts, about the Bigness of unhusked Coffee-berries: These, being planted, produce young Cabbage trees."

The "farinaceous yellow Seed, in Embryo, resembling fine Saw-dust," is very conspicuous when the great spathe bursts by internal pressure, making a cloud. This is commonly thought to be pollen, but it is neither that nor seed; it is a copious caducous flour-like filling in the spathe, about the closely packed spadix.

THE BOTANICAL SEQUENCE

Quotations from these two authors sufficiently attest the early interest in the royal palm and indicate the impression it made on travelers and colonizers. It would far transcend the purpose of this paper to trace the history in other islands and through general writings; but we must consider the botanical record.

Perhaps the botanical sequence may be said to begin with Sir Hans Sloane in Natural History of Jamaica, 1725 (vol. ii, 116, 117) to which subsequent writers make reference, where it is described as "Cabbage-Tree." He speaks of it as "very common in the mountainous and unfrequented Parts of the Island, and because of their Heighth and Straightness are ornamental, and suffer'd to grow when other Wood is fell'd. Every Tree from which the Gemma or Cabbage is taken grows no more, or being fell'd, therefore no wonder if these Trees are scarce near Settlements, and plentiful in the North Side of this Island." It is significant, as we shall see, that Sloane describes the berries of the Jamaica palm as round, whereas Hughes states that the fruits of the Barbadan tree are not so, comparing them to "unhusked Coffee-berries." Sloane states that the Jamaican tree "is a hundred and twenty Foot high, the Cabbage taken out of the Leaves it is folded in, is as big as the small of the Leg, a Foot long, sweet as a Nut when eaten raw."

Patrick Browne, in his Natural History of Jamaica, 1756, describes two of these palms, "The Barbadoes Cabbage Tree" and "The Jamaica Cabbage Tree," apparently thinking them distinct although he does not distinguish them unless that the Jamaican is perhaps not so large and with an "even" trunk, whereas the bole of the Barbadan "bilges moderately at some distance above the root." To this subject we shall come again in the discussion on page 384 of Jamaica royal.

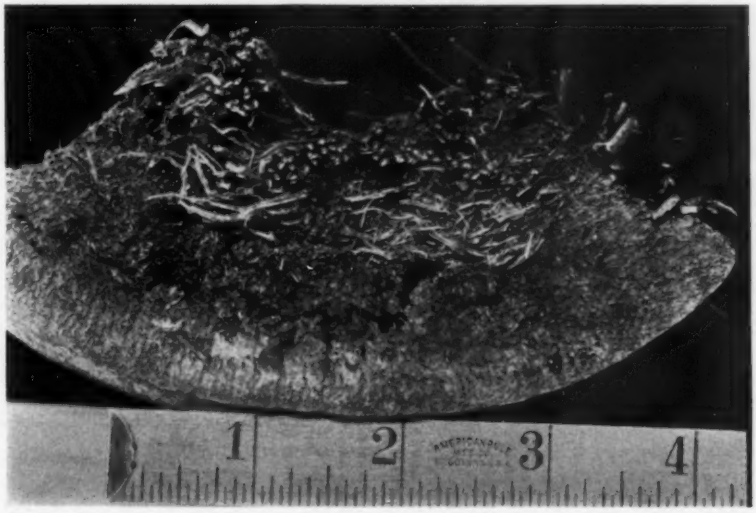


FIG. 197. CHIP FROM A TRUNK of Caribbee royal.—*Roystonea oleracea.*

The earliest botanical binomial applied to the royal palm or cabbage tree is *Areca oleracea* of Jacquin, 1763, in Selectarum Stirpium Americanarum Historia, published in Vienna (Fig. 194). The name *oleracea* naturally follows the species under other generic names.

The next event in the nomenclatorial history of the royal palm is the founding of the genus Oreodoxa by Willdenow in a paper read in 1801 and published in Mémoires de l'Académie Royale des Sciences et Belles-Lettres, for 1804 published in Berlin under date 1807; the paper may have appeared in print in the year 1804 and this is generally accepted as the standard date for the genus. Willdenow described two species, *Oreodoxa acuminata* and *O. præmorsa*, both from the Buenavista Mountains in the province of Caracas, Venezuela, collected by Bredemeyer. This palm has not been subsequently collected from that locality. From the descriptions, Latin and French, it is difficult to identify the palms he had in mind, and original material appears not to exist; there is none at Berlin-Dahlem. In 1815 Kunth took up the genus Oreodoxa (in HBK), without characterization, and added three species, *O. Sancona* of Colombia, *O. frigida* of the

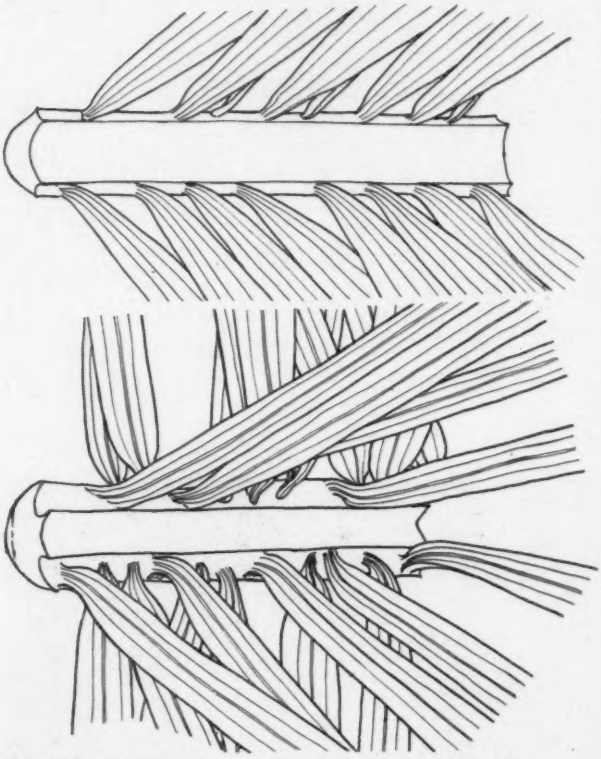


FIG. 198. UNISERIATE AND BISERIATE PINNÆ (×⅓). Above, *R. oleracea;* below, *R. borinquena.*

Andes, *O. regia* of Cuba. Excepting *O. regia*, these plants do not come within a treatment of the royal palms; they have been referred elsewhere.

Martius followed in 1837 by transferring the *Areca oleracea* of Jacquin as *Oreodoxa oleracea* and under this name it remained until 1900 when O. F. Cook pointed out the essential marked differences between the Oreodoxa characterized by Willdenow and the royal palms of the West Indies; to this West Indian group as represented by the Puerto Rican species he gave the name Roystonea, "as a respectful compliment to General Roy Stone, the American engineer officer who secured the admiration of the people of Puerto Rico by his fearlessness and conspicuous energy in the Adjuntas road-building campaign which flanked the line of Spanish defenses, and whose subsequent interest in the improvement of the island will undoubtedly affect its future history." General Stone died in 1905 when sixty-nine years old; he was buried in the National Cemetery at Arlington, Va.

It is clear enough that the royal palms of the West Indies constitute a very different group from the Oreodoxas of Willdenow. This is admitted by Beccari, who, however, continues to use Oreodoxa for the royals. Beccari justifies the use of Oreodoxa for the royal palms by supposing that the type of the Willdenovian genus is a Euterpe (*E. acuminata*), "and accordingly the name of *Oreodoxa*, applied to *O. regia* by Kunth, remains unattached." That is, as the Oreodoxa of 1804 is a synonym of another genus and thereby disposed of, the Oreodoxa of 1815 may be retained for the royal palms. This nomenclatorial shift is not tenable under the Rules.

But there arises the direct question whether *Oreodoxa acuminata* of Willdenow is, in fact, a Euterpe. Beccari states (Palms Indigenous to Cuba, in Pomona College Journal of Economic Botany, ii. no. 2, 255, 1912) that "Wendland has recognized Willdenow's *O. acuminata* in the flowering specimen of a palm, collected by Moritz at Tovar in Venezuela (N. 1670 in the Berlin, Herb.). My own independent researches have led me to the same conclusion, with regard to a fruiting specimen, collected by Fendler (n. 2462 in Herb. de Cand.) also at Tovar, and consequently in a region not remote from Buenavista, from whence came the original specimen of *O. acuminata*.

"The above mentioned Fendler's specimen corresponds exactly to the description of *O. acuminata* given by Willdenow, and most certainly belongs to a typical Euterpe, having the seed with a ruminate albumen." Burret accepts this disposition (Englers Bot. Jahrb. lxiii, 62, 1929). Fendler no. 2462 is in the Gray Herbarium and United States National Herbarium where the writer has examined and photographed it.

Willdenow does not describe the albumen of his Oreodoxas; moreover, he characterizes the flowers as if bisexual whereas they are unisexual in Euterpe; he adds in French the distinct statement that they are bisexual

when speaking of the relationships of Oreodoxa: "Il a des analogies avec *Bactris*, *Areca* & *Elate*, mais il se distingue de tous trois par a fleur hermaphrodite." It is possible, of course, that a pistillode in the staminate blossoms may have given the appearance of perfect flowers.

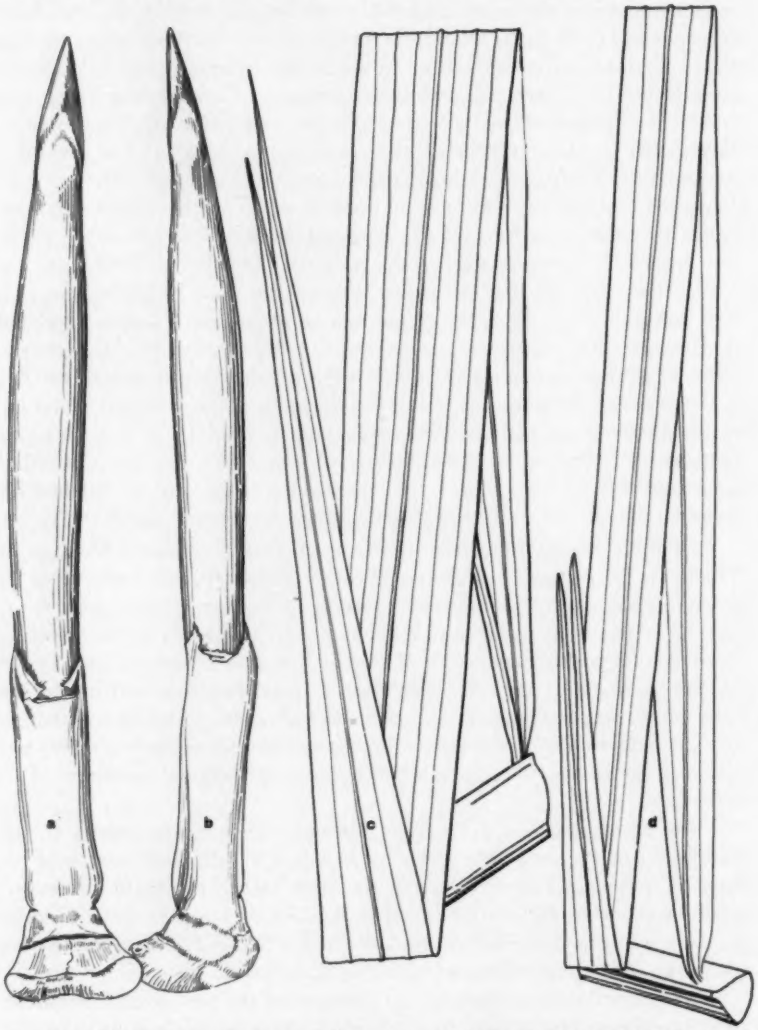


FIG. 199. SPATHE BUD, about 4 feet long, at *a* and *b* showing front and back view of lower spathe, *R. regia*. BROAD AND NARROW PINNÆ of *R. oleracea* at *c*, and of *R. regia* at *d*, about ½ natural size.

It was the opinion of Cook, when he studied this problem (Bull. Torr. Bot. Club, xxviii, 550) that *Oreodoxa acuminata* probably constitutes a distinct genus. The species *O. præmorsa* has been supposed to be a Catoblastus, but may be one of the Martinezia or Aiphanes group.

These various complexities cannot be resolved until good collections are made in the region from which the original Willdenovian species came. But we are certain that the royal palms are not of the genus Oreodoxa of Willdenow. Roystonea is the tenable name.

Not even the name "royal palm" has a clear title. Amongst English-speaking peoples the name is applied only to Roystoneas although not all

FIG. 200. FRUITS OF ROYAL PALMS (somewhat oversize). *a*, *Roystonea oleracea*, two fruits, back and front view of seeds, longitudinal section of seed showing embryo at end. *b*, *R. regia* fruit and seed, with larger view of raphe side. *c*, *R. regia*, a somewhat longer fruit and an enlarged raphe side. *d*, *R. princeps* fruit showing stigmatic scar, and lengthwise section with the thick mesocarp (outside of the seed) and stigmatic protuberance.

Roystoneas may be included under the name. To Spanish-speaking peoples royal palm (palma real) is likely to mean Scheeleas and Attaleas.

With these prefatories behind us, we are ready to review the Roystoneas at present known. The basis of the present paper is much field experience in various parts of the American tropics extending over a series of years and a considerable collection of herbarium material. Yet some of the islands of the West Indian chain have never been well explored for these palms; this is particularly true of the great island of Hispaniola (Haiti, Santo Domingo).

THE EUTERPE RELATIONSHIP

Before proceeding to our discussion we should remember that the genera Euterpe and Roystonea may be confused. Most of the Euterpes are not lofty columnar trees, but some of them have heavy more or less swollen boles and prominent terminal crowns on distinct crownshafts. The genera are distinct enough in flowers and usually also in fruits. Practiced field botanists are not likely to be confused as between Roystonea and Euterpe, for there is nothing in nature just like the big wide-spreading crown of Roystonea and the single pillar-like bole. In some of the Euterpes the trunks are several or cespitose. Technical differences lie in pistillate

flowers: in those of Roystonea the three petals are valvate or come together by their edges; in Euterpe the petals are imbricate or overlapping, an outside one folding over the inner ones; these contrasts are shown in Fig. 196. Fruits of Euterpe are more pea-like or berry-like, more globular, than those of Roystonea, and in the larger number of the species the albumen is strongly ruminate or divided (see Fig. 13, Fasc. i of this volume).

The genus Euterpe is by no means homogeneous. It divides itself readily into two parts, those species with ruminate and those with plain or homogeneous albumen; the latter are placed by Beccari in the subgenus Euterpopsis; it is probably generically distinct, but much more field experience and herbarium material are required to determine this point. Genus Euterpe is monographed by Burret in Engler Botanische Jahrbücher, lxiii, 49-76 (1929); 39 species are recognized, native Nicaragua to Bolivia and Brazil.

As with many of the older genera of palms, Euterpe does not start with a clear definite title. It originates with Joseph Gaertner in his notable De

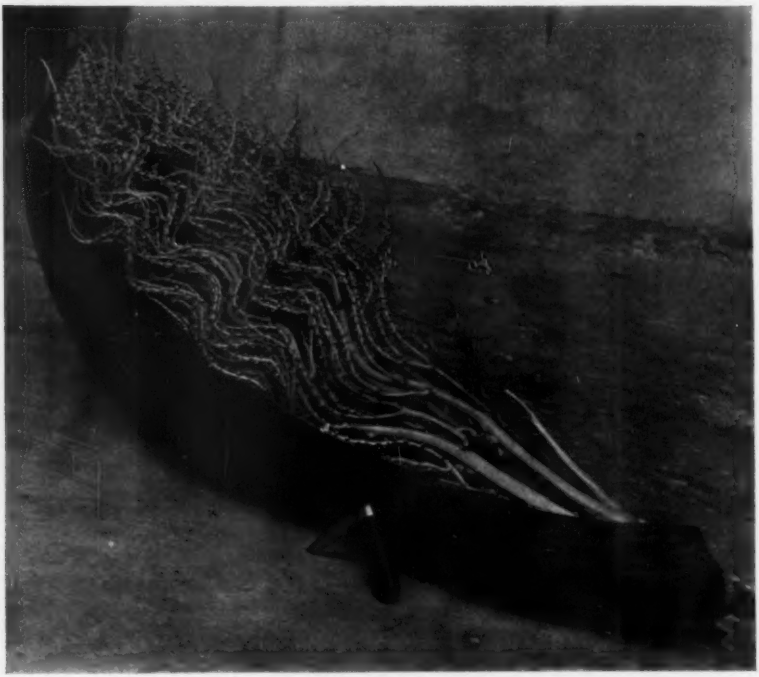


FIG. 201. JUST OPENING SPATHE AND SPADIX of *Roystonea oleracea*, showing the undulate strands.

Fructibus et Seminibus Plantarum, 1788, *E. globosa* and *E. pisifera*, founded on fruits and without knowledge of trees or habitat. It is generally assumed that *E. globosa* is the type and identifiable by the careful picture of the fruit, the citations or synonymy being disregarded; this disposition

FIG. 202. UNDULATE AND STRAIGHT RACHILLÆ of *Roystonea oleracea* and *R. regia* as they show on herbarium sheet.

gives the name *E. globosa* to a well-known palm in certain of the West Indies, and which we shall meet again in a subsequent paper. The other species, *E. pisifera*, becomes in part *Heterospathe pisifera*, Burret (*H. elata*, Scheff.). The standing of Euterpe as a generic name is plainly a question of interpretation. It might have been better if at the beginning the name had been eliminated as a *nomen incertum*. In 1901, in his study of the Puerto Rican palms, O. F. Cook discarded the name Euterpe as having "no true place in American botany, having been proposed originally for an unrelated East Indian palm" on the score of synonymy, and proposed the genera Catis and Acrista. There is much to be said for this disposition. It is a troublesome case, and the writer prefers to follow the established custom of writers on palms and hold the genus Euterpe, particularly as there are no decided gains in transferring all the species, although it may be advisable some day to divide the genus. Euterpe is retained by Martius, Wendland, Bentham & Hooker, Drude, Barbosa Rodrigues, Beccari, Britton, Burret.

FIG. 203. FLOWER PARTS OF ROYSTONEAS. *a*, Mature flower-bud of *R. regia* from HBK. *c*, Bud of *R. oleracea*. *d*, Buds of *R. jamaicana*, staminate and pistillate.

ROYSTONEA

Roystoneas are stately noble American trees, for height and airiness and attractive proportions probably not equalled in the palms. The clean stone-gray boles are arresting objects by day or by night. They are anchored by a dense mass of cord-like roots. They withstand great stress of wind. Frequently the writer has seen them standing headless at full height when the crown had been swept clean away by hurricanes, like titanic telepgraph poles. Yet the trunk is not solid and hard. Like a cornstalk it has a thin dense shell and then a lengthwise mass of numberless fibers; Fig. 197 indicates this gross structure.

Characteristic mark of the royal palms is the single hanging leaf underneath the crown. This is shown even in the quaint pictures of Ligon, reproduced in Figs. 192 and 193, and modernly in Fig. 195. This leaf will be noted in most photographs of these trees. This hanging member is a dead leaf that has fallen but has not yet lost its hold; commonly it drops before the succeeding leaf is ready to fall.

FIG. 204. THE TWO CARIBBEE ROYALS.—*Roystonea oleracea* in front, and var. *excelsior*. British Guiana, South America. Pages 364, 369.

A singularly overlooked yet striking feature of the royal palms is the double spathe. Martius figures the spathe with a single valve or sheath. Humboldt, Bonpland and Kunth describe the sheath of the Cuba royal as monophyllous. Yet the valves are plainly two, as faithfully shown from nature at *a* and *b* in Fig. 199; the lower sheath falls early, however, and only the longer inner one persists and is noted by the observer.

The bulge or swelling of the bole is a prominent character in the Roystoneas. Two characteristic bole shapes are recognizable: the columnar or pillared type represented by *Roystonea oleracea* in which the trunk is broadest at or very near the base and gradually narrows upward; and the bulged or ventricose type represented by the *R. regia* group in which special thickening takes place far above the ground, usually about the middle but sometimes near the top where the trunk emerges above dense undergrowth as in Figs. 206, 226. In some cases the bulge is little noticeable, and in *R. jamaicana* the trunk may be thin, slender and almost uniform, as indicated in the pictures in Fig. 222. The degree of swelling as well also as length and position depend on age of tree, particular habitat, and whether alone in the open or crowded in the forest. One must not draw conclusion from a single tree or one photograph, or rely on general traveler's accounts. A considerable range of photographs is necessary for reliable opinion.

If the reader desires to know the anatomy of stem-thickening in palms he may consult Beccari in Pomona College Journal of Economic Botany, iii, 411 (1913); and he will find an interesting discussion of "The Course and Growth of the Fibro-vascular Bundles in Palms," by J. C. Branner in Proceedings of the American Philosophical Society, xxi, 459 (1883-4). For a full understanding of the bulge development the approach must probably be from the physiological rather than the anatomical side.

The character of the inflorescence or large spadix provides important marks in identification, although seldom mentioned and usually not represented with any adequacy in herbaria. Cook speaks of the inflorescence in founding *Roystonea borinquena:* "twice branched, with the branches more densely clustered, coarser and darker colored than those of the Cuban royal palm, *Roystonea regia*. They are also covered with a slightly hispid brown pubescence while Cuban specimens are much smoother and more pallid." These are important contrasts. The pictures in this paper display the flower-cluster. It is a strong central somewhat fleshy whitish or tawny axis with many ascending slender laterals; these laterals may be simple as usually in *R. regia* or branched and forked as in *R. oleracea* and some others; and the axis, laterals and branchlets may be glabrous, mealy or pubescent, depending on the species. In *R. regia* the laterals remain straight, but in *oleracea* and some others they are often strongly sinuate, crooked or tortuous. The total spadix at anthesis may be 3 or 5 feet high.

The Roystoneas quickly separate themselves into two groups by their leaves: the Oleraceæ, in which the leaf looks simple or flat because the pinnæ are in a single row on either side the rachis; the Regiæ in which the leaves look compound or tousled because the pinnæ are in two rows on either side, one rank divaricate or declined and an upper rank strongly ascending; the picture, Fig. 198, shows this contrast. Good native observers know these differences but they are seldom mentioned in print. With these pinnæ arrangements are associated long drupes and roundish drupes respectively.

Specific lines are more or less indefinite in Roystonea and one cannot depend very confidently on single marks of identification, but rather on combinations or associations of characters. One is aided by knowing the nativity, for the species have apparently been differentiated in the process of time on the separate islands.

One may be familiar with the species of Roystonea and yet be unable to name at sight all the trees encountered in villages and settlements and about old plantations. The species have been extensively transported by seeds in the generations and centuries, from island to island and to mainlands. Under differing conditions the trees may assume strange aspects. It is not known whether the species hybridize but one would expect it because they are almost continuous bloomers (unless carrying full load of fruit) and the

FIG. 205. GOOD SPADIX OR FLOWER-CLUSTER of *Roystonea regia*. Cuba. Page 370.

flowers are frequented by insects. The student of the genus must acquaint himself with the various species as they occur natively and perhaps remotely in their proper places. To begin one's study on the usual cultivated trees is likely to lead to confusion. The author knows individual planted royals up and down the tropics that he does not pretend to name.

Much of the assumed difference between the kinds of royal palms rests on the "looks" of the tree, without reference to characters of spadices, flowers or even of fruits. This method of diagnosis, however, is wholly unreliable. It may catch differences between individual trees rather than between species. It is a singular fallacy not to allow of variation between individuals in the palms as we do in other plants. The writer has previously called attention to this danger (as under Arecastrum in Hortus) and wishes to repeat the caution. One does not try to recognize different species of elm because the individual trees of *Ulmus americana* may be very unlike in looks, nor yet of oaks because not all white oak trees are alike or of white pine or Indian corn or mango. Palm trees of the same species may differ widely in stature and general looks: the critical student of them soon comes to recognize the positive rather than the superficial marks. These differences between given trees may be due to the particular environment, to soil, methods of cultivation, injury, or probably to hereditary tendencies not yet understood. The palm student will save himself much tribulation with *Roystonea regia*, for example, if he appreciates this attitude of approach. Undoubtedly much of the confusion in knowledge of palms is the result of identification by the process of passing by.

One is to recognize, however, that details of these lofty trees are difficult to obtain. Not often can one reach the flowers and fruits, and recourse must be had to extension poles and ladders, men who can climb, strong tools, measuring tape, ropes and the like. There is perplexity, also, in making the heavy collected parts available for study and comparison, and the usual herbarium does not readily hold the parts. Effort is frequently made to avoid this limitation by taking small leaf fragments from young trees, but such materials do not represent a mature bearing palm tree. These difficulties are greatly reduced if one is practiced in the use of a good stand camera: snapshots, motion pictures, pocket cameras, do not meet the requirements. But even if the work seems formidable it is nevertheless the price one pays for understandable material; and the affair is not alarming if one makes up one's mind to it.

ROYSTONEA, O. F. Cook, in Science, ser. II, xii, 479 (1900), in note; Bull. Torr. Bot. Club, xxviii, 549 (1901). ROYAL PALM.
Oreodoxa, Kunth, in HBK. Nov. Gen. et Spec. i, 305, and 244 folio ed. (1815), in part; Martius, Hist. Nat. Palm. iii, 166, t. 156 (1837); not Willdenow.

Tall erect simple unarmed monœcious trees with light colored cylindrical annular clean columnar solitary trunk mostly more or less bulged or swollen, bearing flowers and fruits at apex, above which is a bright lively green crownshaft 1½-2 m. feet or more high surmounted by the spreading crown of large regularly pinnate leaves, base of old trunk commonly on a mound of earth with cord-like roots somewhat showing: leaves falling entire and clear from attachment of the petiole, the petiolar rings on the bole becoming irregular and perhaps obscure with age: inflorescence infrafoliar, at base of crownshaft, consisting of 1 or several erect or ascending pointed long-fusiform glabrous spathes 1-2 m. feet long and 10-15 cm. thick: spathe parts 2, the outer one soon falling and infrequently recognized, extending one-third to nearly one-half the length of the inner one, truncate at apex but with an upward ear-like projection on either side, the margins thin and narrow-wing-like; inner spathe rupturing regularly lengthwise at anthesis and soon hanging as a dead dry brown stave; spadix at anthesis a bush 1-2 m. high, white and at length mostly smooth, comprised of a thick central axis and many side branches with enlarged base and which are again branched into the slender flower-bearing strings, the whole cluster at first standing nearly erect (except in no. 5) but becoming horizontal or declined or drooping in fruit: flowers mostly scattered or irregularly placed, not sunken in rachis, small, unisexual, 3 petals valvate, usually striate when dry, briefly connate at base, 3 sepals much shorter and imbricate, the sexes mostly not definitely distributed along the rachis but sometimes 2 staminate with 1 pistillate between; on a given spadix the staminate flowers may mature

FIG. 206. CHARACTERISTIC HEAD AND BOLE of *Roystonea regia*. Cuba. Page 370.

first, and when they fall the inflorescence may appear pistillate; staminate flowers oblong, 8 mm. or less long just previous to opening and sometimes anther tips visible, 6-15 mm. across in expansion, petals oblong or oblong-ovate, sepals broad-ovate with scarious margins, stamens (mostly 6) prominent and bearing dorsifixed conspicuous anthers, distinct, pistillode mostly prominent if present; pistillate flowers much smaller, conoid, petals short and broad-ovate, with rather prominent calyx forming a cup, staminodes represented by a cup or ring or scales: pistil of 3 carpels, normally with 3 stigmas (perhaps only 2 showing) but usually only 1 carpel developing and forming a single-seeded fruit with stigmatic scar on frontal side near base (Fig. 200d), seldom twin fruits maturing joined at bottom: fruit drupe-like and small, less than 2 cm. long, oblong to nearly globular with rounded end and straight or curved under line, sessile on rachilla, yellowish-brown to red-brown to dark purple and black at maturity, calyx not prominently enlarging to form a cupule, exocarp very thin, mesocarp mostly slight and usually soon dry and fibrous but sometimes prominent and noticeably oily (*R. regia* var. [redacted] or watery (*R. princeps*), endocarp developing into a firm thin shell containing the seed and to which the seed is usually more or less adherent on its back; seed oblong to depressed-globular, raphe a branching or lacerated pattern on its face (Fig. 200, *a*, *b*, *c*), micropyle and embryo basal, albumen hard and equable although lighter colored in center.

Islands or hammocks in the Everglades of Florida through the West Indies to Trinidad and Barbados; not certainly known as indigenous on any

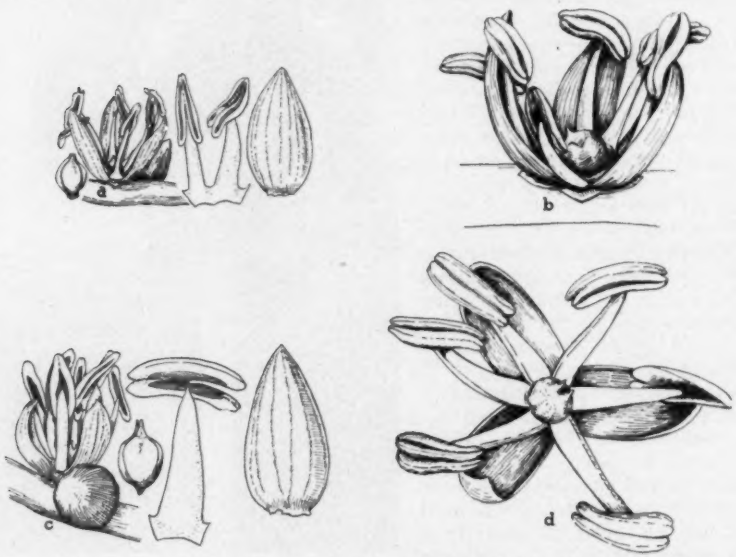


Fig. 207. Flowers of *R. regia* in upper half and of var. *maisiana* in lower part. Showing flower, pistillode, stamens and petals at *a* and *c*, ×2 and about 3; and open staminate flowers at *b* and *d*, about 4.

mainland of Central or South America although the nativity of some of the species is undetermined. Royal palms are widely spread as planted and spontaneous trees in the tropics of the world.

§1. **Oleraceæ.** Uniseriate, the pinnæ on full-grown leaves in a single row or rank on either side the rachis, well shown in the main or central part of the leaf: spadix nearly or quite glabrous or soon becoming so, twice or thrice compound and the branches strongly undulate or crooked in the spathe (Figs. 201, 202) and more or less retaining this character after anthesis: petals of staminate flowers relatively short so that the anthers show even before full anthesis (Fig. 203), stamens 6: fruit distinctly oblong; seed free in endocarp: trunk columnar, usually not swollen at the middle but enlarged for considerable distance from the base up. Very tall palms with leaf-crown prevailingly somewhat horizontal on the bottom in vigorous separate trees of middle age (sometimes strongly ascending) or at least not so heavily drooping as to cover and obscure the flower-clusters (Figs. 195, 204).

Direction of leaves at base of crown wide-spreading: farther West Indies. 1. *R. oleracea*

Direction of leaves strongly ascending: tree taller: Demerara, planted. . . var. *excelsior*

§2. **Regiæ.** Biseriate, the pinnæ of mature leaves (unless on very young trees) in double rank either side of rachis particularly in main or central part of leaf, standing in two planes so that leaves have a comose or tousled look: spadix pubescent, lepidote or glabrous and variously branched, main divisions usually not more than once compound, the rachillæ straight in the spathe except in no. 6 (Figs. 202 right, 205, 214): petals of staminate flowers long and covering the anthers until full anthesis, stamens sometimes more than 6: fruit distinctly of the globular or short-pyriform type; seed mostly adherent in shell or endocarp except in no. 5: trunk of mature trees swollen midway or higher up if at all. Palms mostly of medium altitude with bole scarcely columnar or pillared, the lower part of crown more or less drooping and often covering crownshaft and spadices (Figs. 206, 226).

Rachillæ (or branchlets) of spadix straight or essentially so (perhaps partial exception in var. *pinguis* of no. 2): fruit not angustate at base: bole commonly characteristically tumid or ventricose.

Branches of spadix or flower-cluster erect or diverging, at least until heavily laden with fruit: seed attached in shell or endocarp except perhaps in var. *pinguis* of no. 2: upland species.

Flowers separately placed on rachillæ: spadix glabrous, perhaps glaucous: stamens 6.

Fruit brown-red to dark purple, narrower at base.

Staminate buds at maturity 6 mm. or less long: mesocarp not unusually oily.

Leaf-crown normally covering crown-shaft with drooping leaves (Fig. 206): Cuba, southern Florida. . . . . 2. *R. regia*

Leaf-crown not hiding shaft and spadix: eastern Cuba. . . . . var. *maisiana*

Staminate buds to 8 mm. long: large fruit very oily: eastern Cuba. . . . . var. *pinguis*

Fruit black, small and pea-like: Demerara, planted. . 3. *R. Jenmanii*

Flowers densely placed on rachillæ, usually touching or pressing each other (Fig. 214): spadix lepidote-pubescent: stamens often more numerous (6-9): Puerto Rico. . . . . 4. *R. borinquena*

Branches long-filiform and conspicuously hanging, rachillæ thinly long-pointed and very sparsely flowered: fruit large; seed free: morass habitat: Jamaica. . . . . 5. *R. princeps*

Rachillæ undulate when in spathe and more or less so thereafter, closely flowered on most of the rachillæ: fruit medium in size, distinctly constricted at base; seed somewhat attached in endocarp: bole little if at all tumid or swollen: upland: Jamaica. . . . . 6. *R. jamaicana*

Measurements of fruits in this phytography are made from mature dry drupes.

1. **Roystonea oleracea,** Cook, in Bull. Torr. Bot. Club, xxviii, 554 (1901); Burret, in Engl. Bot. Jahrb. lxiii, 76 (1929). Caribbee Royal Palm. Figs. 191-195, 197, 199c, 200a, 201, 202 left, 203c, 204.

Areca oleracea, Jacq. Select. Stirp. Amer. Hist. i, 278, t. 170 (1763).

Euterpe caribæa, Spreng. Syst. ii, 140 (1825).

Oreodoxa oleracea, Martius, Hist. Nat. Palm. iii, 166, t. 156 f. i, 2, t. 163 (1837).

Oreodoxa caribæa, Dammer & Urban, Fl. Portoricensis (Symb. Antill. iv), 129 (1903).

Roystonea caribæa, P. Wils. in Bull. N. Y. Bot. Gard. viii, 385 (1917), as to name (see *R. borinquena*).

Trunk single, straight, ringed, gray and nude, becoming columnar, to 40 m. and more high and 15-17 dm. in girth at ground when growing in dense forests but becoming twice that dimension when grown separately in the open, usually enlarged at base (the basal bulge being particularly marked in young trees) and gradually tapering upward: crownshaft conspicuous, 2-5 m. high, smooth and vivid green, composed of great closed petiole-sheaths inclosing internal growing axis or bud, leaf-blades extending at more or less right angles on short heavy petioles: leaves 3-7 m. long and 2 m. broad at middle, bearing 100 and more closely placed subopposite glabrous and usually glossy pinnæ from a rachis convex on back and with a channelled ridge on upper face, placed more or less uniformly in a single row or series on either side so that the leaf has a flat look; pinnæ elongated lanceolate, to 1 m. long, basal ones very narrow but central ones to 5 cm. broad, apex long-attenuate and more or less irregularly short-bifid, midrib prominent and 4 or more secondary ribs either side on broadest ones, narrowed and plicate to the sessile base: spadix white at first, very compound and much undulated or waved, mature second or inside spathe-valve upwards of 1 m. long: staminate flowers 6 mm. long, the narrow oblong attenuate petals varying in length but usually not equalling the stamens; pistillate flowers conic-pointed, about 3 mm. long: fruit oblong and somewhat oblique or restricted on one side near base so that it may present a slightly curved appearance, the other side being low-convex, 15-20 mm. long and 9 or 10 mm. thick, obtuse at apex and truncate at base, glabrous and smooth, flesh slight, purplish to nearly or quite black; mesocarp thick; seed-shell (endocarp) light colored, conforming to shape of fruit, 13-15 mm. long and half as thick, surface finely lined lengthwise; seed inside the thin shell 10-12 mm. long with somewhat roughened mottled surface, free in the endocarp, raphe pattern as broad as the face.

Barbados (as in Turner's Hall Wood), Trinidad, Tobago, and probably adjacent islands. Although long known and extensively spread over the world, the native range of this noble palm is even yet undetermined. This is due to inaccurate differentiation between the species and lack of adequate material in the herbaria. The old citations of range are unreliable. We

now know it is not native in Jamaica to which it was attributed until very recent date, as when Beccari examined the materials from that island in his study of the palms of Cuba, 1912. It is not known whether the species is indigenous on the contiguous South American mainland. Knuth lists it in Venezuela only with a question mark (Initia Floræ Venezuelensis, 160, 1928).

The Caribbee royal palm is much planted in the Lesser Antilles and is frequently seen in more northern islands; it is rarely grown in southern Florida. It is a favorite avenue tree in many places because of its straight pillared elevated bole crowned with a capital-like head; Fig. 191 shows one of the famous avenues in Jardim Botanico, Gavea, Rio de Janeiro. A royal

FIG. 208. FULL-LADEN MATURE SPADIX of *Roystonea regia* from a tree of the Big Cypress region of the Florida Everglades. Page 370.

This truss was 40 inches high and 32 inches broad, and weighed upwards of 40 pounds. The red-brown fruits becoming practically black were 18 quarts or 22,000 berry-like drupes.

palm is displayed on one of the issues of paper money for Trinidad and Tobago.

Leaves are employed for thatch, logs for construction, and there are other uses. The concealed terminal bud is boiled and eaten, the tree being felled to obtain it; for this reason it is called "cabbage palm," a use preserved in Jacquin's original name "oleracea"; the "cabbage" of other Roystoneas is eaten also, as well as that of other genera of which the cabbage palmetto (*Sabal Palmetto*) is an example.

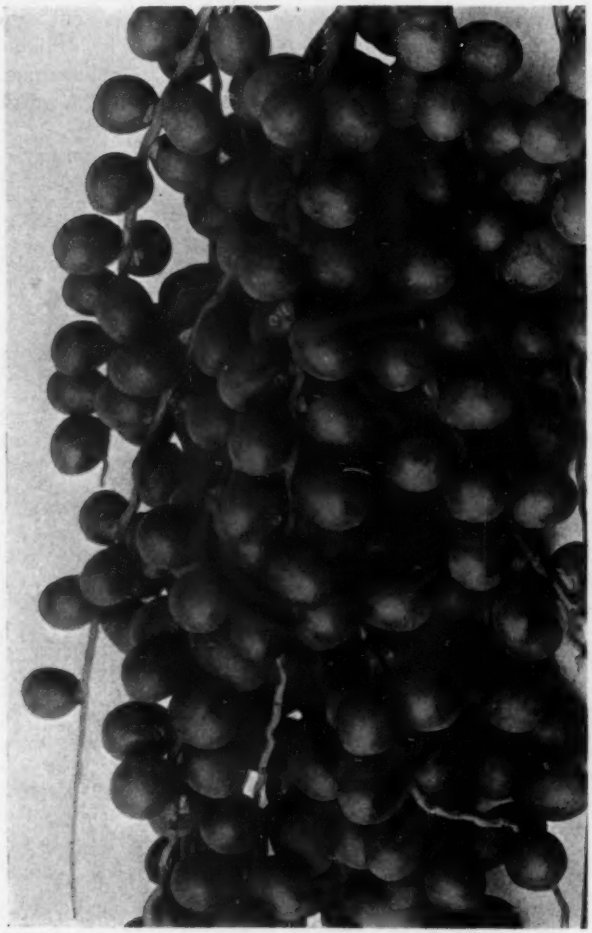


FIG. 209. FRUITS, NATURAL SIZE, of *Roystonea regia* from Florida; same cluster as Fig. 208.

In founding the species *Areca oleracea* Jacquin gave no definite locality, but stated that it was common in the Caribbean region, —"Habitat vulgaris in Caribæis." His description calls for oblong berries, and his illustration presents an acceptable picture of the fruit we now associate with *oleracea*.

There has been varying practice in

accounting for the name *Euterpe caribæa* of Sprengel. Two considerations place it definitely as a synonym of *Roystonea oleracea:* he cites *Areca oleracea*, Jacq. as a synonym; he states that the fruit is "oblongis subincurvis."

The height to which *Roystonea oleracea* may attain appears to be undetermined by actual measurement. Heights to 200 feet and more are given, but this is doubtful. Accounts by early travelers are to be taken with due allowance. Note the conservative statement of 134 feet by Hughes in 1750 (page 346), which must have been based on actual measurement. The greatest height known to the author is the *palma mater* in Jardim Botanico, Rio de Janeiro, which at the time of a visit (then an old tree) was computed to be 125-135 feet. The writer took the occasion of the felling of a forest in preparation for a highway in the Guayaguayare region of southeastern Trinidad, in company with W. E. Broadway, to measure recently fallen trees; the palms had grown tall in a dense forest, but the highest one he found was 110 feet from ground to tip of topmost leaf. The slenderness of the straight bole is likely to produce an exaggerated impression of height.

Dimensions of the Guayaguayare royals, which seemed of unusual height, are indicated by careful measurements of four trees as they lay on the ground with foliage still attached; altitudes are from surface of ground to base of leaf-head or crown (bole and crownshaft), then perpendicular distance through crown to pinnacle leaf-point, together with diameters of bole or trunk:

No. 1. Diam. at 4 ft. above ground, 18 in.; at 80 ft., 9½ in.; height 80+6 or 86 ft. over all. Tree in full bearing.

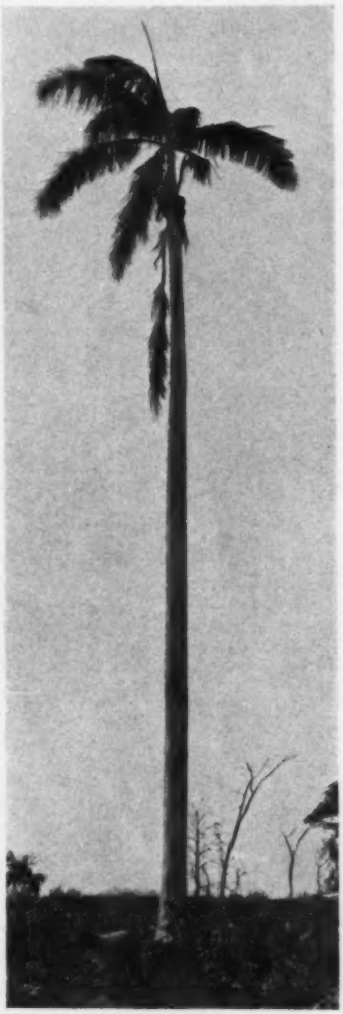


FIG. 210. THE MAISI ROYAL.—*Roystonea regia* var. *maisiana*. Page 376.

No. 2. Diam. at 1½ ft. above ground, 15 in.; at 94 ft., 5½ in.; height 94+8 or 102 feet total.

No. 3. Diam. at 4 ft., 21 in.; at 50 ft., 12½ in.; at 86 ft., 12 in.; height 94+16 or 110 ft.

No. 4. Diam. at 4 ft., 19 in.; at 94 ft., 12 in.; height 94+16 or 110 ft. total height.

The heavy stout *R. oleracea* at Ancon, Canal Zone, seen in Fig. 3, fasc. i, vol. iii, is 8 ft. 3½ inches in circumference at surface of ground.

For a tree so conspicuous and so marked in its characteristics, the Caribbee royal has been singularly misnamed and misconstrued in collec-

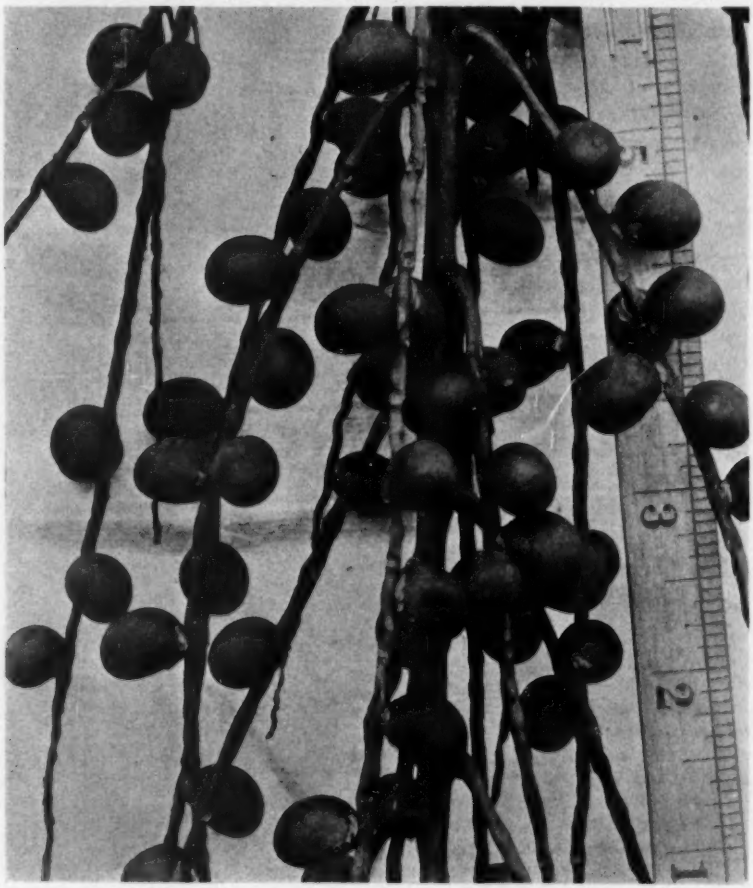


Fig. 211. Fruits of Maisi royal, *Roystonea regia* var. *maisiana*, about natural size. Eastern Cuba. Page 376.

tions and horticulture. It frequently passes as *regia*, despite the different bole and habit, striking crown, very different staminate flowers and oblong fruits and broader stiffer pinnæ. Seeds purchased of a standard seedsman in printed packets labelled *regia* are *oleracea*. The species is so well marked in its fruit and seed that little more than the outline in Fig. 200 is needed for identification, whereas in the remaining species the contrasts can be presented convincingly only in photographs.

† **R. oleracea** var. **excelsior,** var. nov. Fig. 204.

Altior: folia comæ inferiora prominenter ascendentia.

Tree very tall; crown composed of closely placed ascending scarcely

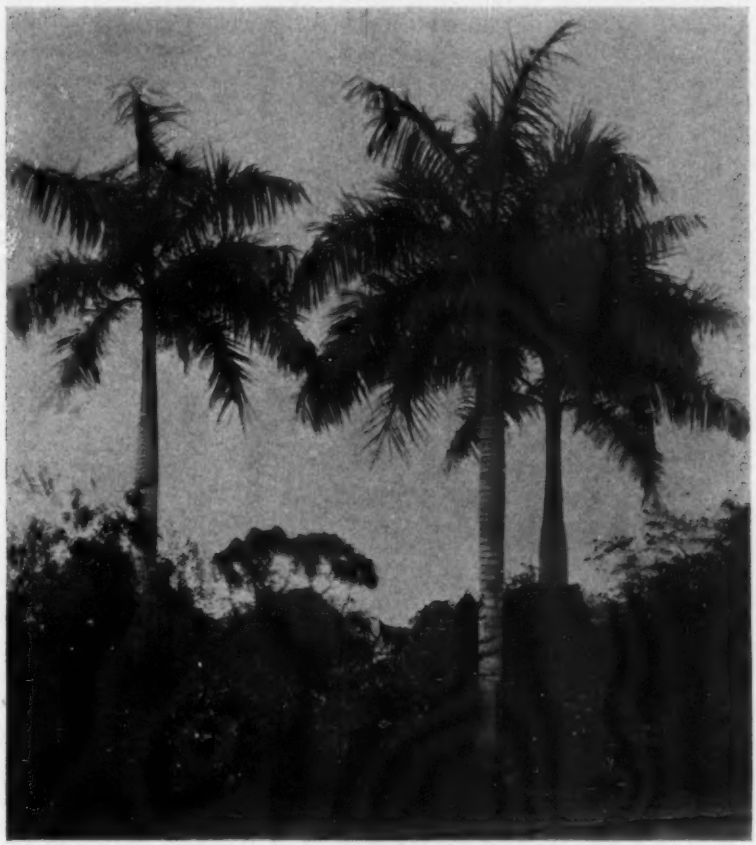


FIG. 212. THREE YOUNG TREES of *Roystonea Jenmanii*. Botanic Garden, Georgetown, British Guiana. Page 378.

curved leaves, so that its base is neither flat or drooping but has a tapering or cuneate-upward look.

Georgetown, British Guiana, in the Botanic Garden and somewhat planted elsewhere; nativity unknown. Perhaps it is only a stature form of *R. oleracea;* technical botanical characters appear not to separate it, although petals of the staminate flowers are smaller than in most cases of *oleracea.*

This general crown shape (of var. *excelsior*) appears in Jacquin's picture of *Areca oleracea,* Fig. 194. One does not care to found a species or variety on that picture, however, not knowing whether the tree may have been cropped for thatching, nor indeed whether the picture is accurate; accompanying pictures of coconut and Acrocomia (*Cocos aculeatus*) in Jacquin only crudely represent those trees, with crowns very unlike the species themselves. Moreover, it would be inexcusable in taxonomy to elevate to specific rank what is perhaps an aberrant form and to make the prevailing kind a variety of it.

The var. *excelsior* was early labelled *Oreodoxa regia* var. *Jenmanii* in the Botanic Garden at Georgetown but the name has not been published and the palm is quite unlike *Roystonea Jenmanii.* The tree is well represented in Plate XV, a general view, in the Agricultural Journal of British Guiana, i, 1928, in an article by A. A. Abraham on "Palm Features of the Botanic Gardens."

2. **Roystonea regia,** Cook, in Science, ser. II, xii, 479 (1900), in note; Bull. Torr. Bot. Club, xxviii, 554 (1901). Cuba Royal Palm. Figs. 199, 200 bc, 202 right, 203a, 205, 206, 207 ab, 208, 209, 226.

Oreodoxa regia, HBK. Nov. Gen. et Spec. i, 305, and 244 folio ed. (1815); Martius, Hist. Nat. Palm. iii, 168, t. 156 ff. (1837).

Roystonea floridana, Cook, in Bull. Torr. Bot. Club, xxviii, 554 (1901).

Euterpe ventricosa, C. H. Wright, in Kew Bull. 1906, 203.

Euterpe acuminata, Waby, in Journ. Bd. Agric. Brit. Guiana, xii, 54 (1919), not (Willd.) Wendl.

Polymorphous species: rather slender tree in forests or thick groves with increased diameter near the middle and gradual taper either way or toward the summit when standing above other vegetation, but stocky when standing alone and with a rather uniform central bulge and usually an enlarged base, sometimes the irregularity taking the form of a constriction some feet above the ground and giving an hourglass appearance, 7-25 m. or more tall, either erect or somewhat out of perpendicular, the trunk often crooked, seldom column-like: leaf-blades extending in all directions, the lower ones on well-developed trees gracefully downward-curved or hanging making an orb-like crown that covers the crownshaft and flower-clusters: leaves usually

FIG. 213. REPRESENTATIVE TREES of Puerto Rico royal.—*Roystonea borinquena*.
Page 378.

shorter than in *R. oleracea*, pinnæ prevailingly in a double row either side the rachis and standing in different planes giving the leaf a cylindrical or brush-like rather than a flat look; pinnæ usually less than 1 m. long and narrow, 2-3 cm. or only seldom 4 cm. broad, basal and terminal pinnæ about 1 cm. broad, primary side ribs 2 or 3; rachis usually with a narrow central channel and upstanding sharp edges at the middle part: spadix only moderately compound, 1 m. or more long at anthesis, the main lateral branches once or twice ramose, soon glabrous: flowers loosely disposed on the rachis,

FIG. 214. FLOWER-CLUSTER OR SPADIX of *Roystonea borinquena* in Puerto Rico. Page 378.

the staminate buds at maturity 5 mm. long and anthers not showing: fruit various, mostly long-globose (but not oblong with more or less parallel sides), 8-13 mm. long and 8-10 mm. broad, somewhat narrowed to base, dull dark red, red-brown or purplish at maturity.

Cuba, where it is abundant on lower mountains and in valleys and fields; southern Florida, in Dade, Collier and Monroe counties (see John K. Small, Journ. N. Y. Bot. Gard. xxix, 1-9, 1928), best known on certain hammocks in the Everglades. Reported indigenous occurrences on other islands are not repeated here because the state of knowledge of Roystonea does not allow of positive commitment. Panama assignments by Seemann (not Humboldt) are undoubtedly erroneous, the palm so determined being *Œnocarpus panamanus*, Bailey (Gent. Herb. iii, 34). Type locality of *regia* may be taken as the region about Havana, where it is still abundant (HBK: "Crescit frequentissime in insula Cuba prope Havana, Regla, Ojo de Agua et Guanavacoa").

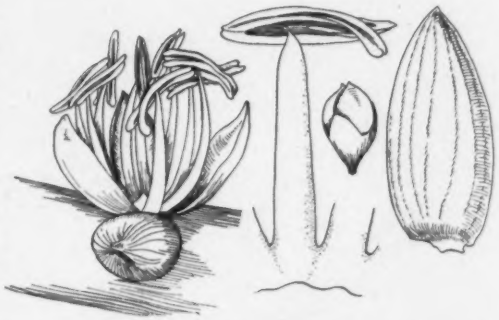


FIG. 215. FLOWER PARTS of *R. borinquena*. A flower ×4, showing 9 stamens; stamen, pistillode and petal ×5.

This is the royal palm so much planted in southern Florida, probably originally from both native and Cuban seed; trees have also been transplanted directly from the wild.

Flowers of Bonpland no. 1276, Havana, considered to be the type of *Oreodoxa regia*, are at the Muséum d'Histoire Naturelle, Paris, and they correspond well with those taken by the writer in Cuba. Staminate bud of the Bonpland material, with stamens not showing, is at *a* in Fig. 203.

Variation in height and bole of *R. regia* is puzzling to the systematist, and much of it is not readily related to environment. The usual field forms are low trees of 50 feet or less. In thick groves or in forests the trees are likely to be taller and the trunks with slight swelling and perhaps no distinct bulge. On bottom lands along Rio Miel near Baracoa, Oriente, Cuba, the author studied a thick natural planting in which boles were very slender and without bulges; careful shadow-tests showed some of the trees to be well above 100 feet tall; other natural trees in the vicinity presented more of the usual *regia* appearance.

The Cuba royal is widely distributed in cultivation, under various

names and disguises; some of the forms may be hybrids although it is not justifiable to announce hybridity without substantial evidence.

Wright's original description of *Euterpe ventricosa*, which Burret refers to *R. regia*, calls for fruits 6.3 mm. in diameter. Such small fruits the writer has not seen in *R. regia* when at maturity; the fruits of *ventricosa* collected by him in Demerara are 9 or 10 mm. diameter, and other samples recently received from there are similar.

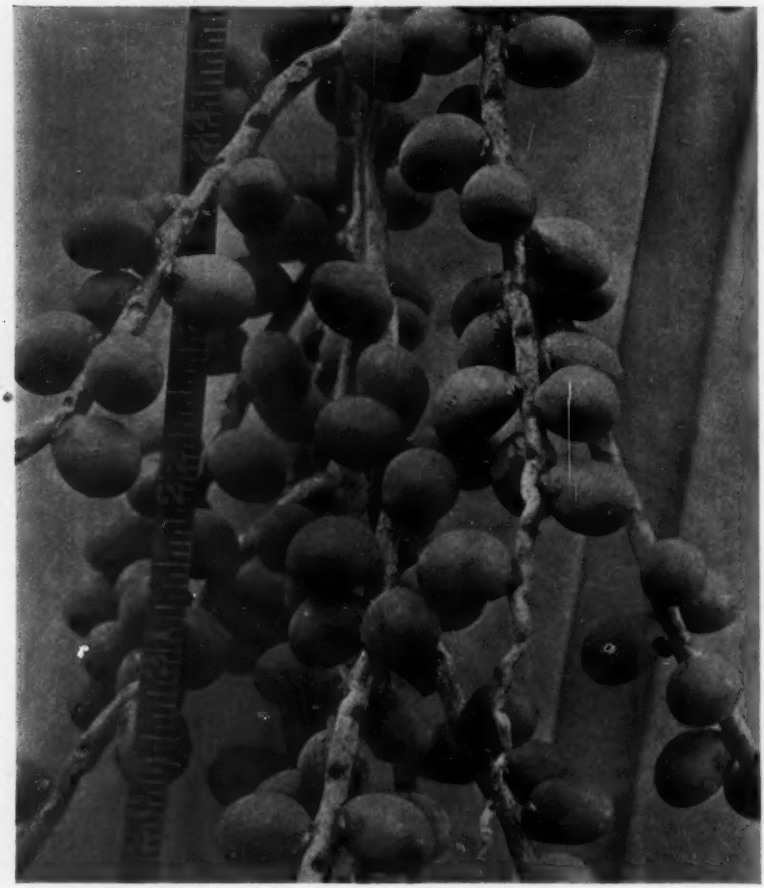


FIG. 216. FRUITS IN NATURAL SIZE of Puerto Rico royal palm.—*Roystonea borinquena.*

FIG. 217. TREES OF MORASS ROYAL, *Roystonea princeps*, in a deep swamp in Jamaica.
Page 379.

† **R. regia** var. **maisiana,** var. nov. Figs. 207 cd, 210, 211.

Alta, vix ventricosa, coma non prominenter pendens, fructus breviter elongato-globosus, semen fere non adhaerens: flores staminati fere majores quam in *R. regia.*

Slender tree to 20 m., the bole bearing little indication of swelling above the base: crown small, of 8-12 wide-spreading leaves, the lower ones arched

FIG. 218. SLENDER SPADIX, with narrow hanging branches, of the morass royal.—*Roystonea princeps,* Jamaica. Page 379.

downward but not prominently drooping so that the flower-clusters and crownshaft are well exposed: flower-cluster or spadix with many slender over-arching or drooping branches that are not undulate: staminate buds at maturity about 6 mm. long, being slightly larger than in *R. regia:* fruit short-oblong-globose, 13-14 mm. long and 10-11 mm. thick; seed mostly loose in the shell or endocarp, the raphe stramineous, fimbriate and resembling a coccid-like patch.

Los Llanos (El Veril and vicinity), Oriente, at the extreme eastern end of Cuba on the plateau back of the rugged escarpment facing Cape Maisi, at about 1500 feet altitude; abundant in the woods and sometimes seen in open areas where the forest has apparently been cleared as in Fig. 210 (*Bailey no. 15143*). The tree looks very different from the accustomed forms

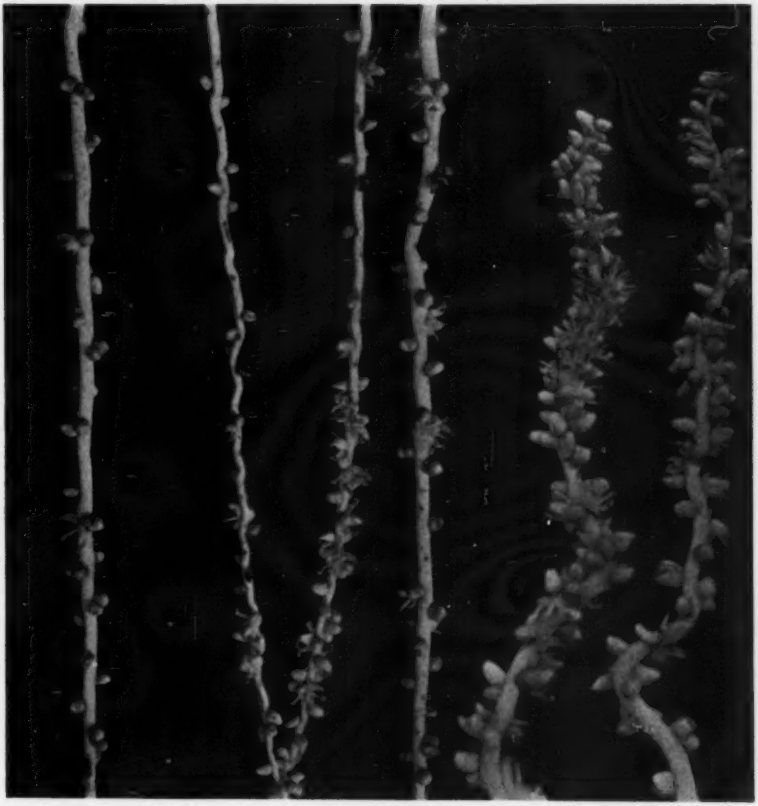


FIG. 219. RACHILLÆ IN FLOWER of *Roystonea princeps*, four left, and of *R. jamaicana*, right. About natural size.

of *R. regia* and may be specifically distinct; *R. regia* itself is in some of the openings and about buildings at that locality, probably introduced.

† **R. regia** var **pinguis,** var. nov.

Altissima: alabastra staminata 7-8 mm. longa: fructus magni, 14-15 mm. longi, 10-11 mm. crassi, mesocarpium valde oleaceum: semen paene vel omino non adhaerens.

Tree very tall, 30-40 m., 55 cm. diameter near base: fruits large and thick, 14-15 mm. long and 10-11 mm. thick, subglobular and hardly narrowed at base, mesocarp ample and oily, seed essentially globular, nearly free from endocarp or shell, raphe-figure very large: staminate buds large, to 8 mm. long: rachillæ somewhat wavy.

Banks of Imías River, Oriente, Cuba. *Brother León no. 14248.*

3. **Roystonea Jenmanii,** Burret, in Engl. Bot. Jahrb. lxiii, 76 (1929). Fig. 212.

Euterpe Jenmanii, C. H. Wright, in Kew Bull. 1906, 203.

Trunk of medium height lacking very prominent bulge: crown open, not densely foliaged, the lower leaves not heavily covering the flower-clusters: pinnæ very narrow, from 5-25 mm. broad, the nerves showing strongly: staminate buds 7 mm. long: fruit small and pea-like, very nearly globular, 8, 9 or 10 mm. across, black at maturity.

Recognized only in Georgetown, British Guiana, whence it was sent to Kew by George S. Jenman, Superintendent of the Botanic Gardens; nativity unknown; perhaps a hybrid, or a mutant from *R. regia.* "Jenman found three plants of this species growing on one of the parapets in the centre of the city of Georgetown from which he obtained fruit and raised a batch of seedlings."—*J. F. Waby* in Journ. Bd. Agric. Brit. Guiana, xii, 54 (1919).

This tree, *R. Jenmanii,* is probably in other botanic gardens, as Trinidad and Dominica, among the variety of palms known as *regia.*

4. **Roystonea borinquena,** Cook, in Bull. Torr. Bot. Club, xxviii, 552 (1901). PUERTO RICO ROYAL PALM. Figs. 213, 214, 215, 216.

Oreodoxa charibæa, Becc. in Pomona Coll. Journ. Econ. Bot. ii, 263 (1912).

Oreodoxa borinquena, Reasoner; Bailey, in Stand. Cyclo. Hort. 2405 (1916).

Roystonea caribæa, P. Wils. in Bull. N. Y. Bot. Gard. viii, 385 (1917), as to plant (see *R. oleracea*).

Stocky mostly straight tree of medium height, to 18 m. tall and 60 cm. diameter at base, the gray bole usually spindle-shaped or somewhat thickened at middle: head fairly heavy although not so dense and well furnished as the best crowns of *R. regia,* the large leaves spreading-arching and the lower ones hanging but usually not completely hiding the crownshaft and flower-clusters: leaves to 3 m. or more long and to 2 m. broad, more or less glossy, pinnæ numerous in double series; pinnæ about 1 m. long and narrow,

commonly about 3 or 4 cm. or less broad but the largest ones sometimes 5 cm., midrib very prominent as well as two or more side ribs, apex divided into 2 long slender points, under surface midrib of broadest ones more or less scurfy particularly toward base, narrowed at attachment to the rachis which (at the middle) is deeply channelled between the two thin ridges: spathe bud at maturity 1 m. and more long: main branches of spadix (the axes of which are brown furfuraceous) bearing simple straight side-branches 15-30 cm. long which are so densely flowered as to appear to be packed, individual flowers often so close as to appear to be doubled, rachillæ thick and stout: flowers large, the staminate buds 6-7 mm. long and the sterile flowers 12-15 mm. across at anthesis, stamens often 9 or more than 6 and large with prominent purple anthers: fruit (sometimes twin) obovoid or short-oblong, 12-15 mm. long and 9-11 mm. thick, one side nearly straight

FIG. 220. FLOWERS OF JAMAICA PALMS. *A*, *R. jamaicana* ×3; stamens, pistillode and petal more enlarged. *B*, same of *R. princeps*.

or lightly concave, yellowish-brown at maturity, or seed brownish with reddish tinge; seed oblong, 8-10 mm. long, adherent to endocarp on back, raphe coccid-like with fimbriate margins.

Puerto Rico, in fields and forests and on hillsides, common and characteristic of the island; reported also on Vieques and St. Croix. Type "taken in the plaza of Juana Diaz," *Cook*.

As in other Roystoneas, the leaves are used for thatch and the fruit eaten by pigs.

The name *borinquena* commemorates "borinquen," aboriginal designation of the island.

5. **Roystonea princeps,** Burret, in Engl. Bot. Jahrb. lxiii, 76 (1929); Bailey, Gent. Herb. ii, 187 (1930). MORASS ROYAL PALM. Figs. 200d, 217, 218, 219 left, 220b, 221.

Oreodoxa princeps, Becc. in Pomona Coll. Journ. Econ. Bot. ii, 266 (May 1912), and in Urban, Symb. Antill. vii, 171 (June 1912).

Slender attractive soft-wooded tree with trunk to 10-12 m. up to the flower-cluster and 30 cm. diameter at base, the bole either slightly thickening midway or of uniform diameter until narrowed above the middle, straight, or somewhat bent by competition, the rings evident: crown light and open, with lower leaves divaricate, the crownshaft and inflorescence standing clear: leaves rather slender, 3 m. long and 2 m. or less broad, pinnæ

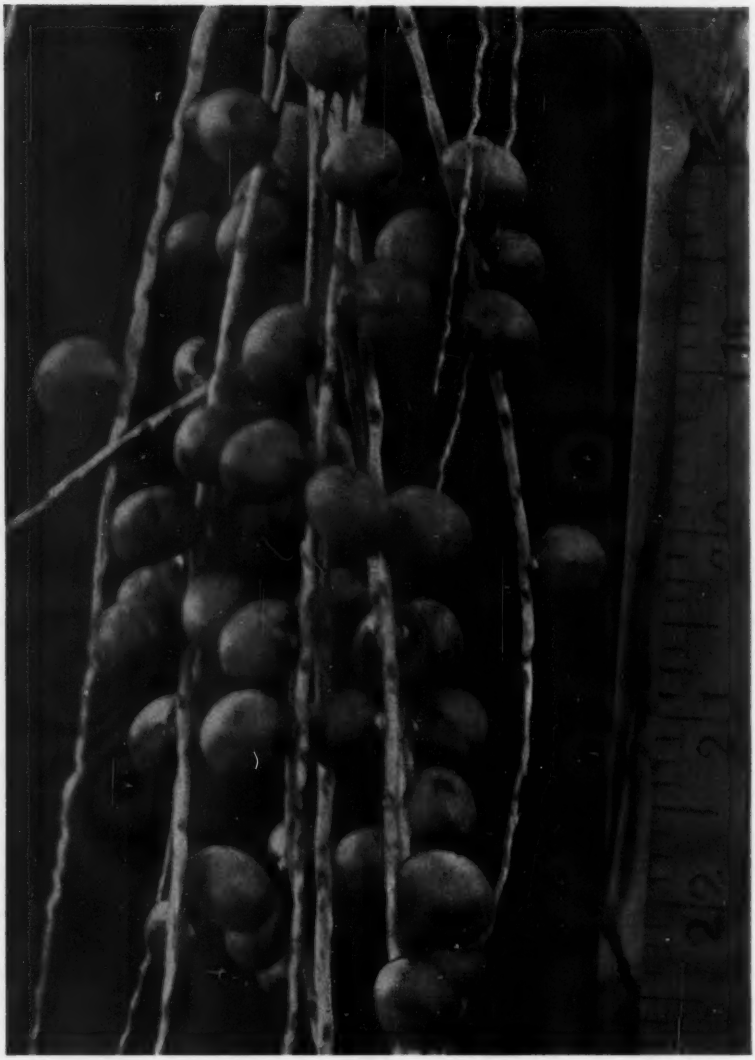


FIG. 221. FRUITS OF MORASS ROYAL, not quite largest size.—*Roystonea princeps* in Jamaica.

FIG. 222. TWO TREES of Jamaica royal palm.—*Roystonea jamaicana*. Page 384.

showing in two series only at middle; pinnæ very many, 165-170 either side the rachis, rather thin or soft, narrow, about 90 cm. long, broadest about 4 cm. wide but mostly 2 cm. or less and long-attenuate to base, midrib and side ribs prominent underneath, light colored or gray on under surface and dull green on upper face, very slender apices shortly bifid into narrow points: spathe at full growth rather narrow, 1.5 m. long, exterior glabrous; spadix glabrous, mostly only twice branched, the branches or rachillæ exceedingly slender and hanging, these parts often 30-40 cm. long and only 1 or 2 mm. thick or even less when fresh and long-attenuate into very thin points, very sparsely flowered, the main lateral axes themselves only 5-7 mm. thick and finely striate, the entire cluster when in bloom about 1.5 m. high from bottom to top of the slender hanging strands: flowers fragrant, light violet, scattered and often remote with rachis sometimes bare for spaces of 1-4 cm., small, staminate buds only 3 mm. long just preceding anthesis and anthers not showing and spreading 5-6 mm. when expanded, petals not appreciably nerved, the anthers small (less than 2 mm. long and scarcely versatile), dark purple as if black: fruit oblong-globular, 15-18 mm. long and about 12-13 mm. broad, with a deflexed but scarcely constricted basal end, brown-red, the prominent mesocarp likely to be watery; seed oblong, 9-11 mm. long and about 6 mm. broad, loose in the endocarp, the face nearly covered by the large ramose raphe.

FIG. 223. FRESH SPATHE of Jamaica royal.—*Roystonea jamaicana*. Page 384.

Jamaica, in a deep quaking morass or bog at Middle Quarters, St. Elizabeth Parish, forming a considerable grove; a few other trees reported near Black River to which the morass is tributary.

Species based by Beccari on Harris no. 9843 taken in 1907 in a

morass at Middle Quarters. This number the author has examined at the herbarium of the Department of Agriculture at Hope Gardens, Kingston, Jamaica, and also in the National Herbarium in the Smithsonian Institution, Washington; in both cases Harris had apparently recognized the palm as distinct from the common "mountain cabbage" (*R. jamaicana*); each specimen had been given a different new specific name by Britton but neither was published. The author has collected the palm in the deep morass, and Figs. 217-221 are made therefrom.

Although the morass royal was first recognized botanically as late as

FIG. 224. FRUITING CLUSTER OR SPADIX of Jamaica royal.—*Roystonea jamaicana*.

1912, a water palm was apparently known a century earlier as attested by Lunan in his voluminous Hortus Jamaicensis, 1814: "The Cabbage trees are said to abound in the morasses towards Negril Bay, where they grow to the height of one hundred and fifty or one hundred and sixty feet." Negril is at the western extremity of the island, far away from the Black River region, and a marsh is indicated there. In the Middle Quarters morass the trees attained no such height as indicated by Lunan. Beccari quotes Harris as authority for the statement that the tree is "about 18 meters high," a dimension undoubtedly meant to cover the total elevation of the palm. On his label at Hope Gardens Harris writes "tree up to 60 ft. high." The author's statement of bole 10-12 meters in the foregoing diagnosis is based on actual measurements of native trees in bearing; to this dimension is to be added the crownshaft and leaf-crown. Most of the boles seen by the writer were symmetrically formed, showing a gradual but evident taper in the upper third.

In the New York Botanical Garden are two sheets of Harris 9843 from Middle Quarters, named *R. princeps* by Britton; also two sheets of Britton 1637 from the same place at the same date (Sept. 23, 1907); and two sheets from Negril and vicinity, "border of Great Morass," Britton & Hollick 2100, March 9-12, 1908, 25 meters high. W. Harris, Superintendent of Hope Gardens, Kingston, had collaborated with N. L. Britton in the preparation of a Jamaica Flora, but which was not published. The manuscript had been returned to Dr. Britton May 28, 1908. Under Roystonea in this manuscript are two species keyed as follows:

Fruit narrowly oblong, curved. 1. oleracea
Fruit oblong-ellipsoid, scarcely curved. 2. princeps

The latter had been given a new specific name by Britton but *R. princeps* was later substituted. *R. oleracea* is "mountain cabbage" and occurs on "hillsides in moist regions from 200 to 1500 meters"; *R. princeps*, "marsh cabbage" is "in morasses and river valleys near the coast." What was known to Harris and Britton as *R. oleracea* is here described as *R. jamaicana*.

† 6. **Roystonea jamaicana,** spec. nov. JAMAICA ROYAL PALM. Figs. 219 right, 220a, 222, 223, 224, 225.

Areca oleracea, Lunan, Hort. Jamaicensis, i, 133 (1814), in part.
Oreodoxa oleracea, Auth.
Oreodoxa regia, Becc. in Pomona Coll. Journ. Econ. Bot. ii, 263, f. 113 (1912).

A *R. regia* differt trunco tenui non-ventricosoque, coma culmen superius spadicesque non celante, rachillis undulatis in spatha, fructu obpyriformi cum basi angusto vel constricto.

Slender hard-wooded palm to 20 m. or less, the trunk commonly with continuous gradually narrowing outline and no bulge: crown usually sparse and open, often less than 10 leaves, not drooping completely over the crown-shaft and flower-clusters, and these parts therefore remaining conspicuous from the ground: leaves to 3 m. long, with conspicuously flattened lower

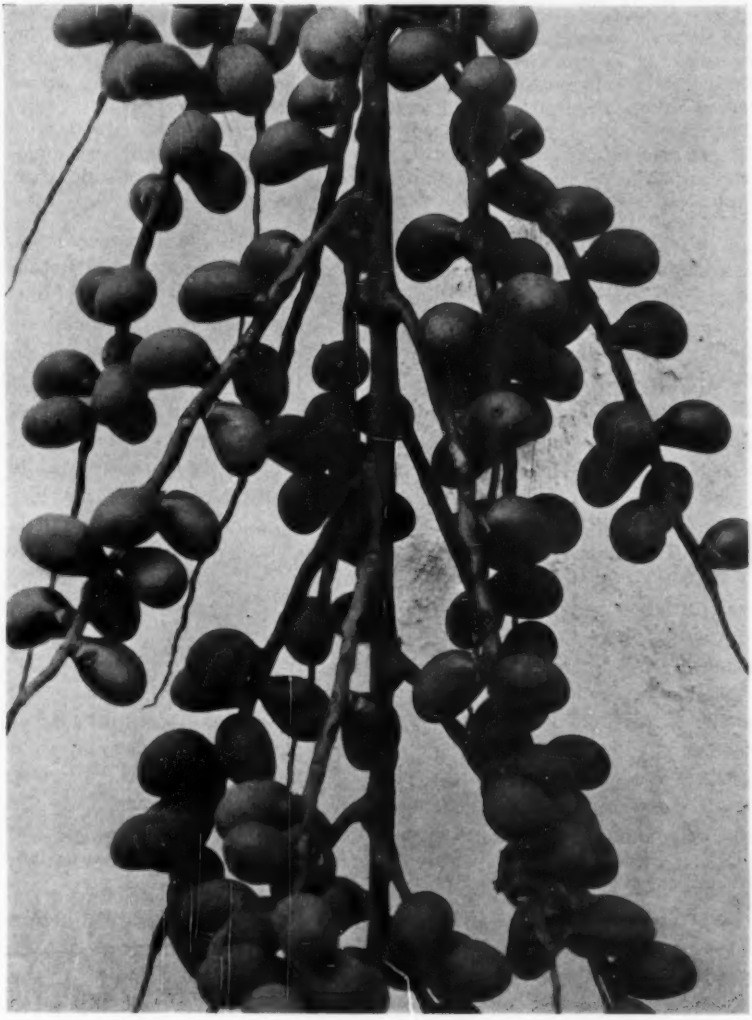


FIG. 225. NATURAL SIZE FRUITS of Jamaica royal palm.—*Roystonea jamaicana.*

rachis, pinnæ in double series either side; pinnæ 60 or more cm. long, green both sides or not prominently lighter colored underneath, main or larger ones 3-5 cm. broad, mid and side ribs prominent and not scaly or lepidote underneath, bilobed at apex and one of the lobes likely to be caudate: flower-clusters or spadices relatively short and most of the branches rigid or soon becoming so, glabrous, the main laterals 4-5 or 6 dm. long, with short side-branches or rachillæ of ordinary thickness and not needle-pointed nor filiform-drooping, densely flowered: flowers larger than those of *R. princeps* for the most part, staminate buds 5 mm. long before anthesis and the petals conspicuously nerved and the expanded flower 10 mm. across but variations occur in size: fruit oblong-globular or obpyriform, 12-15 mm. long and 9-11 mm. broad, one side straightish or somewhat curved, with a more pronounced "neck" than in *R. princeps*, mesocarp thin; seed somewhat adherent to the shell or endocarp by its back, about 8-10 mm. long, raphe less laciniate.

"Mountain cabbage" of Jamaica, common on hills and ridges, on bluffs, in woods and fields in somewhat elevated valleys, more rarely in lower situations; long known as *Oreodoxa oleracea* and since Beccari's studies (1912) as *O. regia*, but clearly distinct from either. Type localities of *R. jamaicana* are in nterior valleys, as near Ewarton in St. Catherine and Claremont in St. Ann (as *Bailey nos. 15069, 15071*).

Although Beccari gave a definite and accurate account of *O. princeps*, as far as his scant material allowed, that species has not been recognized recently in Jamaica; but the writer collected it fully in the morass at Middle Quarters in 1931, and found it to be strikingly different from the older species; this led to a new study of the common upland palm. The distinctness of *R. jamaicana* from *R. princeps* now remains a problem for residents of Jamaica, by detailed study, to determine. In flower-clusters of *R. jamaicana* one may now and then find a rachilla or strand suggesting those of *R. princeps*, but the author has not seen any of them nearly so long and slender and so sparsely furnished and so straight and long-pointed as on the other species, nor a comparable spadix. One is a water palm, unusual in the genus, the other an upland species; there appear to be consistent differences in stature, bole, under surface leaf color, very broad and flat lower part of rachis of leaf of the upland species, pattern of rachillæ, size of flowers, striate petals of staminate flowers, size and shape of fruits, adhering seed, while the long drooping straight filiform flower-branches of *princeps*, swaying in the wind, and the fragrant bloom, are apparently unlike anything else known in Roystonea.

We have noted (page 349) that Patrick Browne in 1756 made distinction between "The Barbadoes Cabbage Tree" and "The Jamaica Cabbage Tree," seeds of the former having been "first carried to Jamaica by the present governor, His Excellency Admiral Knowles." He describes the Barbadan tree as of "a very considerable size" and says it is "the most

beautiful tree I have ever seen, and may be very lawfully esteemed the queen of the woods." The Jamaica cabbage "grows commonly to a moderate size," and was even then known as mountain cabbage. More than a half century later Lunan seems to consider the two palms, the Barbadan and Jamaican, to be different: "The Barbadoes cabbage, which is planted here for ornament, is one of the most beautiful trees in the world." From Barbados also originated the majestic *oleraceas* in British Guiana according to Sir Robert Schomburgk in his History of that island in 1848.

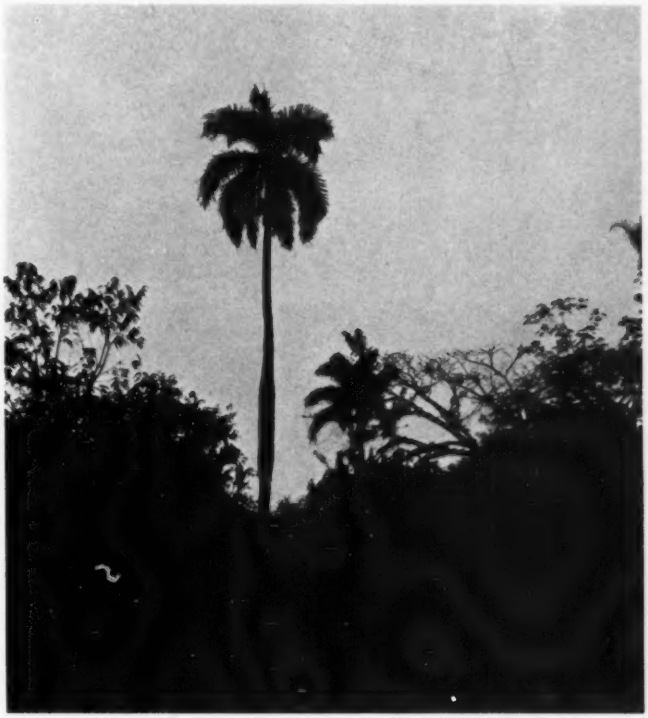


FIG. 226. NIGHTFALL, when *Roystonea regia* makes silhouette above woodlands of Cuba. Exposure 15 minutes.